What is Claimed:

1. A terahertz (THz) frequency radiation source to emit THz frequency radiation in a narrow wavelength band within a wavelength range of about 3 μm to 3000 μm comprising:

a broad bandwidth THz frequency emitter to generate broad bandwidth THz frequency radiation in an emitted wavelength band within the wavelength range, the emitted wavelength band having;

a mid-band wavelength within the emitted wavelength band; and

an emitted bandwidth greater than or equal to about .01 times the mid-band wavelength;

a first planar waveguide optically coupled to the broad bandwidth THz frequency emitter to transmit the broad bandwidth THz frequency radiation;

a disk resonator evanescently coupled to the first planar waveguide with a resonance wavelength band within the emitted wavelength band, the resonance wavelength band having a resonance wavelength bandwidth of less than or equal to about .25 times the emitted bandwidth; and

a second planar waveguide evanescently coupled to the disk resonator to transmit THz frequency radiation in the narrow wavelength band, the narrow wavelength band being substantially equal to the resonance wavelength band of the disk resonator.

2. The THz frequency radiation source of claim 1, wherein the broad bandwidth THz frequency emitter is one of:

a silicon/silicon-germanium quantum well structure intersubband electroluminescence emitter;

a resonant state transition emitter;

a non-quantum well, doped group IV material emitter;

a blackbody radiation source; or

an incandescent radiation source.

3. The THz frequency radiation source of claim 1, wherein:

the first planar waveguide includes;

a first waveguide portion having a substantially rectangular cross-section and a bottom surface, the first waveguide portion formed of a waveguiding material, the waveguiding material being substantially transmissive in the emitted wavelength band and having a waveguide index of refraction; and

a first pedestal portion connecting a central portion of the bottom surface of the first waveguide portion to a substrate;

the disk resonator includes;

a resonator portion having a substantially cylindrical shape and a bottom surface, the resonator portion formed of the waveguiding material; and

a resonator pedestal portion connecting a central portion of the bottom surface of the resonator portion to the substrate; and

the second planar waveguide includes;

a second waveguide portion having a substantially rectangular cross-section and a bottom surface, the second waveguide portion formed of the waveguiding material; and

a second pedestal portion connecting a central portion of the bottom surface of the second waveguide portion to the substrate.

4. The THz frequency radiation source of claim 3, wherein the waveguiding material is a substantially undoped material formed of one or more group IV elements.

5. The THz frequency radiation source of claim 4, wherein the substantially undoped material formed of one or more group IV elements includes at least one of:

a crystalline material formed of one group IV element;

a crystalline material formed of an alloy of group IV elements;

an amorphous material formed of one group IV element;

an amorphous material formed of an alloy of group IV elements;

an amorphous crystalline material formed of one group IV element;

an amorphous crystalline material formed of an alloy of group IV elements;

a polycrystalline material formed of one IV element; or

a polycrystalline material formed of an alloy of group IV elements.

6. The THz frequency radiation source of claim 4, wherein the substantially undoped material formed of one or more group IV elements is selected from a group consisting of: diamond, crystalline silicon, crystalline germanium, crystalline silicon carbide, crystalline silicon germanium, polycrystalline silicon, amorphous diamond, amorphous silicon, and amorphous germanium.

7. The THz frequency radiation source of claim 3, wherein:

the first pedestal portion of the first planar waveguide is formed of the waveguiding material;

the resonator pedestal portion of the disk resonator is formed of the waveguiding material;

the second pedestal portion of the second planar waveguide is formed of the waveguiding material; and

the substrate is formed of the waveguiding material.

8. The THz frequency radiation source of claim 3, wherein:

the first pedestal portion of the first planar waveguide is formed of a pedestal material, the pedestal material having a pedestal index of refraction, the pedestal index of refraction being less than the waveguide index of refraction; and

the resonator pedestal portion of the disk resonator is formed of the pedestal material; and

the second pedestal portion of the second planar waveguide is formed of the pedestal material.

9. The THz frequency radiation source of claim 1, wherein the mid-band wavelength within the emitted wavelength band is a peak wavelength of the emitted wavelength band.

10. The THz frequency radiation source of claim 1, wherein the emitted wavelength band includes wavelengths within the wavelength range for which the broad bandwidth THz frequency emitter generates an emitted spectral power greater than a predetermined spectral power.

11. The THz frequency radiation source of claim 1, further comprising:

an additional disk resonator evanescently coupled to the first planar waveguide with an additional resonance wavelength band within the emitted wavelength band, the additional resonance wavelength band;

having an additional resonance wavelength bandwidth of less than or equal to about .25 times the emitted bandwidth; and

being distinct from the resonance wavelength band; and

a third planar waveguide evanescently coupled to the additional disk resonator to transmit THz frequency radiation in the additional resonance wavelength band of the additional disk resonator.

12. A terahertz (THz) frequency radiation detector to detect a narrow wavelength band of THz frequency radiation within a wavelength range of about 3 μm to 3000 μm, comprising:

a broad bandwidth THz frequency radiation detector with a detection wavelength band within the wavelength range, the detection wavelength band having;

a shortest detected wavelength within the detection wavelength band; and

a detection bandwidth greater than or equal to about .01 times the shortest detected wavelength; and

a narrow bandwidth THz frequency band wavelength selector coupled to the broad bandwidth THz frequency radiation detector to select and transmit only THz frequency radiation in the narrow wavelength band to the broad bandwidth THz frequency radiation detector, the narrow bandwidth THz frequency band wavelength selector including;

a first planar waveguide optically to receive input radiation;

a disk resonator evanescently coupled to the first planar waveguide with a resonance wavelength band within the detection wavelength band, the resonance wavelength band having a resonance wavelength bandwidth of less than or equal to about .25 times the detection wavelength bandwidth; and

a second planar waveguide evanescently coupled to the disk resonator and optically coupled to the broad bandwidth THz frequency radiation detector to transmit the narrow wavelength band of THz frequency radiation from the disk resonator to the broad bandwidth THz frequency radiation detector, the narrow wavelength band being substantially equal to the resonance wavelength band of the disk resonator.

13. The THz frequency radiation detector of claim 12, wherein the broad bandwidth THz frequency radiation detector is one of:

a silicon/silicon-germanium quantum well structure detector;

a resonant state transition detector;

a non-quantum well, doped group IV material detector; or

a bolometer.

14. The THz frequency radiation detector of claim 12, wherein:

the first planar waveguide includes;

a first waveguide portion having a substantially rectangular cross-section and a bottom surface, the first waveguide portion formed of a waveguiding material, the waveguiding material being substantially transmissive in the narrow wavelength band and having a waveguide index of refraction; and

a first pedestal portion connecting a central portion of the bottom surface of the first waveguide portion to a substrate;

the disk resonator includes;

a resonator portion having a substantially cylindrical shape and a bottom surface, the resonator portion formed of the waveguiding material; and

a resonator pedestal portion connecting a central portion of the bottom surface of the resonator portion to the substrate; and

the second planar waveguide includes;

a second waveguide portion having a substantially rectangular cross-section and a bottom surface, the second waveguide portion formed of the waveguiding material; and

a second pedestal portion connecting a central portion of the bottom surface of the second waveguide portion to the substrate.

15. The THz frequency radiation detector of claim 14, wherein the waveguiding material is a substantially undoped material formed of one or more group IV elements.

16. The THz frequency radiation detector of claim 15, wherein the substantially undoped material formed of one or more group IV elements includes at least one of:

a crystalline material formed of one group IV element;

a crystalline material formed of an alloy of group IV elements;

an amorphous material formed of one group IV element;

an amorphous material formed of an alloy of group IV elements;

an amorphous crystalline material formed of one group IV element;

an amorphous crystalline material formed of an alloy of group IV elements;

a polycrystalline material formed of one IV element; or

a polycrystalline material formed of an alloy of group IV elements.

17. The THz frequency radiation detector of claim 15, wherein the substantially undoped material formed of one or more group IV elements is selected from a group consisting of: diamond, crystalline silicon, crystalline germanium, crystalline silicon carbide, crystalline silicon germanium, polycrystalline silicon, amorphous diamond, amorphous silicon, and amorphous germanium.

18. The THz frequency radiation detector of claim 14, wherein:

the first pedestal portion of the first planar waveguide is formed of the waveguiding material;

the resonator pedestal portion of the disk resonator is formed of the waveguiding material;

the second pedestal portion of the second planar waveguide is formed of the waveguiding material; and

the substrate is formed of the waveguiding material.

19. The THz frequency radiation detector of claim 14, wherein:

the first pedestal portion of the first planar waveguide is formed of a pedestal material, the pedestal material having a pedestal index of refraction, the pedestal index of refraction being less than the waveguide index of refraction; and

the resonator pedestal portion of the disk resonator is formed of the pedestal material; and

the second pedestal portion of the second planar waveguide is formed of the pedestal material.

20. The THz frequency radiation detector of claim 12, wherein the detection wavelength band includes wavelengths within the wavelength range for which the broad bandwidth THz frequency radiation detector detects radiation having a spectral power greater than a predetermined spectral power.

21. The THz frequency radiation detector of claim 12, further comprising:

an additional broad bandwidth THz frequency radiation detector with an additional detection wavelength band within the wavelength range, the additional detection wavelength band having;

an additional shortest detected wavelength within the detection wavelength band; and

an additional detection bandwidth greater than or equal to about .01 times the additional shortest detected wavelength; and

wherein;

the narrow bandwidth THz frequency band wavelength selector is further coupled to the additional broad bandwidth THz frequency radiation detector to select and transmit only THz frequency radiation in an additional narrow wavelength band to the additional broad bandwidth THz frequency radiation detector; and

the narrow bandwidth THz frequency band wavelength selector further includes;

an additional disk resonator evanescently coupled to the first planar waveguide with an additional resonance wavelength band within the detection wavelength band, the additional resonance wavelength band;

having an additional resonance wavelength bandwidth of less than or equal to about .25 times the additional detection wavelength bandwidth; and

being distinct from the resonance wavelength band; and

a third planar waveguide evanescently coupled to the additional disk resonator and optically coupled to the additional broad bandwidth THz frequency radiation detector to transmit the additional resonance wavelength band of THz frequency radiation from the additional disk resonator to the additional broad bandwidth THz frequency radiation detector.